Remarks

Please cancel claims 8 and 12-14 without prejudice.

Claims 1-7, 9-10, and 15-22 are pending. Claims 8 and 11-14 are currently canceled. Claims 16-20 have been withdrawn from consideration. Claims 1, 5, 6, 9, 10, 15, and 21 are currently amended. The Applicants respectfully request that the Examiner enter these amendments to address § 112 formalities and to address the claim objection of original claim 14 which has been canceled, and to simplify issues for appeal. These amendments are presented to comply with requirements of form expressly pointed out in the Office Action of 11/28/2007. Reconsideration of the application, as amended, is respectfully requested.

Claim Objections

Claim 14 has been canceled to remove the objection under 37 CFR 1.75(c) as purportedly being of improper dependent form for failing to limit the subject matter of a previous claim. Claim 15 has been amended to change the claim dependency, and now limits the subject matter of claim 1 from which it depends. With the cancellation of claim 14 and the amendment of claim 15 the Applicants have overcome the objection and the objection should be withdrawn.

§ 112 Rejections

Claims 1-10 and 12-15 are rejected under 35 USC § 112, first paragraph, as purportedly failing to comply with the written description requirement. The Examiner has asserted that the identified claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The Applicants traverse this rejection for at least the following reasons. Claim 1 is a method of producing $Li_y[Ni_xCo_{1-2x}Mn_x]O_2$ by mixing the lithium mixed metal hydroxide of the same stoichiometry with LiOH or Li_2CO_3 and a boron compound as a sintering agent to form a mixture which is then sintered to obtain the designated product. Fig. 1 of the present application shows the theoretical density of $Li_y[Ni_xCo_{1-2x}Mn_x]O_2$ as a function of x obtained through x-ray diffraction. In Fig. 1 theoretical density is calculated and a regression curve presented for x values from 0 to 0.5. Clearly, the Applicants possessed the concept of the invention for

$0 \leq x \leq 0.5$. See, e.g., In re Vas-Cath, Inc. v. Mahurkar, 19 USPQ2d, 1117 (supporing drawings alone can provide the written description of the invention required by §112, first paragraph). Applicants had possession of the invention for all values (as designated by the line) of x displayed in Fig. 1 at the time the application was filed. Of course this includes values of x that are less than or equal to 0.35. Additionally, on page 13 in Table 3 of the specification Applicants show data for $x = 0.1$ and 0.25 when the sintering agent is boron oxide. Further, the specification on page 12, line 25 points out that Fig. 5C presents data for $x = 0.375$. Thus, the Applicants clearly had possession within the meaning of § 112. In re Union Oil Co. of California v. Atlantic Richfield Co., 54 USPQ2d, 1232 (the written description requirement does not require the applicant "to describe exactly the subject matter claimed, [instead] the description must clearly allow persons of ordinary skill in the art to recognize that [he or she] invented what is claimed."). It is clear that the Applicants demonstrated possession of the invention over the whole range of x as in the amended claim at the time the application was filed. Claims 8 and 11-14 have been canceled. Claims 2-10 and 15 depend upon claim 1 and add further limitations to that claim. Since Claim 1 complies with 35 USC § 112, first paragraph, so do claims 2-10 and 15. The Applicants respectfully submit that the rejections of claims 1-10 and 15 under 35 USC § 112, first paragraph, have been overcome, and that the rejection should be withdrawn.

Claims 1-10 and 12-15 stand rejected under 35 USC § 112, first paragraph, as purportedly failing to comply with the written description requirement. The Examiner has asserted that the claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The Examiner has further asserted that claim 1 recites "a pellet density of at least 3.3 g/cm^2", which is not supported by the specification as filed.

The Applicants have amended claim 1 to read "having a pellet density from about 3.3 to about 4.0 g/cm^3" to expedite prosecution and to correct units. Support for this amendment can be found, for example, on page 3, lines 12-13 of the specification as filed. The Applicants respectfully submit that the rejection of claim 1 under 35 USC § 112, first paragraph, has been overcome, and that the rejection should be withdrawn. Claims 8 and 11-14 have been canceled. Claims 2-10 and 15 all depend upon claim 1 and add further limitations to claim 1. Since

claim 1 has now been shown to be patentable under 35 USC § 112, first paragraph, claims 2-10 and 15 are likewise patentable. In summary, Applicants submit that the rejection of claims 1-10 and 15 under 35 USC § 112, first paragraph, has been overcome, and that the rejection should be withdrawn.

Claims 1-10 and 12-15 are rejected under 35 USC § 112, first paragraph, as purportedly failing to comply with the written description requirement. The Examiner has asserted that the claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The Examiner has further asserted that claim 1 recites "the total amount of boron compound(s) is greater than 0.2% of the total weight of the mixture", which is not supported by the specification as filed. Furthermore, the Examiner has asserted that the specification discloses an amount of sintering agent of "about 0.1 to about 5.0 wt%, preferably about 0.2 to about 3.0 wt%, more preferably about 0.5 to about 1.0 wt% (page 3), but does not provide support for sintering agent amounts greater than 5.0 wt% of the total weight of the mixture (page 3).

Applicants have amended claim 1 to read "the total amount of boron compound(s) is greater than 0.2% and up to about 10% of the total weight of the mixture." Support for this amendment can be found, for example, page 4, lines 12-17. Applicant respectfully requests that the Examiner enter these amendments to address the purported 35 USC § 112, first paragraph rejections. Claims 8 and 11-14 have been canceled. Claims 2-10 and depend upon and add further limitations to claim 1. Since claim 1 is now allowable, likewise claims 2-10 and 15 are now allowable. In summary, Applicants submit that the rejection of claims 1-10 and 15 under 35 USC § 112, first paragraph, has been overcome, and that the rejection should be withdrawn.

Claims 21 and 22 are rejected under 35 USC § 112, first paragraph, as purportedly failing to comply with the written description requirement. The Examiner has asserted that the claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The Examiner has further asserted that claim 21 recites "the total amount of alkali fluorides is greater than 0.2% of the total weight of the mixture", which is not supported by the specification as filed. The Examiner has

also asserted that the specification discloses an amount of sintering agent of "about 0.1 to about 5.0 wt%, preferably about 0.2 to about 3.0 wt%, more preferably about 0.5 to about 1.0 wt%" (page 3), but does not provide support for sintering agent amounts greater than 5.0 wt% of the total weight of the mixture (see page 3 of the Office Action mailed 11/28/2007).

Claim 21 has been amended to recite total amount of alkali fluorides is greater than 0.2% and up to about 10% of the total weight of the mixture. Support for this amendment can be found in the specification as filed, for example, in Table 1 where the amount of LiF in the third sample is 0.2% and on page 4, lines 12-17. Applicants respectfully that request that the Examiner enter the amendment to claim 21 to address the purported 35 USC § 112, first paragraph rejections. Claim 22 depends upon claim 21 and adds further limitations thereto. Since claim 21, as amended, is now allowable under 35 USC § 112, likewise so should claim 22. In summary, Applicants submit that the rejection of claims 21 and 22 under 35 USC § 112, first paragraph, has been overcome, and that the rejection should be withdrawn.

Claims 1-10 and 12-15 are rejected under 35 USC § 112, second paragraph, as purportedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. The Examiner has asserted that claim 1 recites the limitation "boron compound(s)". The Examiner has further asserted that there is insufficient antecedent basis for this limitation in the claim. The Applicants respectfully traverse. Claim 1 provides, *inter alia*, "a boron compound as sintering agent" and "a" means "at least one" including the plural under well-settled patent law. The specification as filed, e.g., page 4, lines 10-12, describes sintering agents selected from … boron compounds (for example, boric acid, boron oxide, and/or lithium borates; preferably B_2O_3), and mixtures thereof. Thus, ample support and antecedent basis both are present. Reconsideration and withdrawal of this rejection are respectfully requested.

The Examiner stated that claim 5 recites "the amount of sintering agent being mixed is about 0.1 to about 5.0 weight percent of the resulting mixture", and asserted that this is inconsistent with independent claim 1. The Examiner has further asserted that similarly, claim 6 is inconsistent with claim 1 because "about 0.2" is broader than "greater than 0.2" for the low end of the claimed range for the sintering agent. Similarly, claim 8 was asserted to be

inconsistent with claim 1 because "less than about 10" encompasses values lower than "greater than 0.2".

Applicants have amended claim 5 to recite "is greater than 0.2%" to address this concern. Support for this amendment can be found, for example, in claim 1 itself. Applicants respectfully request that the Examiner enter these amendments to eliminate 35 USC § 112, second paragraph rejections. With these amendments, claims 5 and 6 are now consistent with claim 1.

The Examiner noted that numerous claims recite the phrase "at least about" and asserted that this phrase is indefinite. Examiner suggests the term "about" be deleted. Applicants respectfully traverse this suggestion.

One of skill in the art is aware of limitations of stoichiometry, propagation of uncertainty, and that a certain degree of approximation is intrinsic to the description of specified ranges, but still is enabled to practice the invention. Furthermore, the specification recites the invention in a general manner and a person skilled in the art, practicing the claimed invention, would not conclude that precisely achieving the limits of the claimed ranges is necessary for the operation of the invention as presented. Additionally, the use of the term "about" is supported in case law as a proper way to express that a chemical feature is the cited numerical amount with some small latitude for inexactness of amounts. Measurement necessarily is associated with some degree of uncertainty. For example, the CAFC has established that a claim should be interpreted to allow for the use of the term "about" to prevent an infringer from improperly abusing the Patent Law by changing the percentage of a chemical constituent by a small percentage to avoid infringement (See, e.g., Ecolab, Inc., v. Envirochem, Inc., 264 F.3d 1358, 1367 (Fed. Cir. 2001) (supporting words such as the term "about" are descriptive terms that may be employed to avoid a strict numerical boundary to the specified parameter)). In summary, one skilled in the chemical arts of this invention would recognize that it is not necessary to achieve absolute precision with respect to ranges and that the use of the term "about" captures reasonable variations of the specified ranges that are clearly within the spirit of the invention. To expedite prosecution, Applicants have removed the phrase "at least about" as suggested by the Examiner. (Emphasis added).

The Examiner has asserted that claims 9 and 10 recite the limitation "the resulting densified composition". The Examiner has further asserted that there is insufficient antecedent

basis for this limitation in the claim. Applicants have amended claims 1, 9 and 10 to provide antecedent basis by defining the product of the method of claim 1 as "a densified composition of $Li_y[Ni_xCo_{1-2x}Mn_x]O_2$" and by referring to that composition in claims 9 and 10. Support for this amendment can be found, for example, on page 2, lines 27-28 of the specification. Applicants request that the Examiner enter this clarifying amendment and withdraw the rejection.

The Examiner has asserted that claim 10 recites "72 percent of theoretical density", which is indefinite because it is unclear how the theoretical density is determined. Applicants traverse. A definition of theoretical density can be found, for example, on page 5, lines 4-10. There is adequate discussion of how to calculate the theoretical density in the specification. Applicant requests reconsideration of this rejection. One of ordinary skill in the art would be able to determine the theoretical density (ThD) using the equation on page 5, line 4 of the specification.

Claims 12 and 13 have been canceled.

In summary, Applicants submit that the rejections of claims 1-10 and 15 under 35 USC § 112, second paragraph, have been overcome, and that the rejection should be withdrawn.

§ 102 Rejections

Claims 1-3, 5-10, 14 and 15 are rejected under 35 USC § 102(b) as purportedly being anticipated by Shiozaki et al. (JP 2002-304993).

Applicants respectfully traverse this rejection for at least the following reason. The Examiner has not shown that Shiozaki describes, teaches, or suggests all of the elements of even Applicants' claim 1. Claim 1 requires heating the resulting mixture until a composition of $Li_y[Ni_xCo_{1-2x}Mn_x]O_2$ having a pellet density of from about 3.3 to about 4.0 g/cm^3 is obtained for use in a lithium-ion battery. The Examiner has asserted that the pellet density of claim 1 and the properties recited by claim 9 and 10 of the produced Li-Ni-Co-Mn-oxide compound are considered inherent in view of the teachings of Shiozaki. The Examiner has not met the initial burden necessary to support an inherency rejection. "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that

a certain thing may result from a given set of circumstances is not sufficient.'" See In re Robertson, 49 USPQ2d 1949 (1999). Further, "[i]n relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic *necessarily* flows from the teachings of the prior art." See Ex parte Levy, 17 USPQ2d 1464 (1990).

Applicant note that there appears to be no discussion or data in Shiozaki of pellet density and the Examiner has made no attempt to show this feature necessarily flows from the Shiozaki teaching. Therefore the Applicants respectfully request that this rejection be withdrawn. Claims 2-3, 5-7, 9-10, and 15 depend upon claim and add further limitations to claim 1. Claims 8 and 14 have been canceled. Since claim 1 is allowable, claims 2-3, 5-10, and 15 should be likewise allowable. The rejection of claims 1-3, 5-10, 14 and 15 under 35 USC § 102(b) as purportedly being anticipated by Shiozaki et al. is unwarranted should be withdrawn.

§ 103 Rejections

Claims 21 and 22 are rejected under 35 USC § 103(a) as purportedly being unpatentable over Kang et al. (US 7,205,072 B2). The Examiner has asserted that Kang teaches a cathode material that has a formula $Li_{1+x}Ni_\alpha Mn_\beta Co_\gamma O_{2-z}F_z$ wherein z is between about 0 and 0.2 (abstract). The Examiner has also asserted that to prepare the cathode material, appropriate amounts of lithium hydroxide (or lithium carbonate), lithium fluoride and Ni-Mn-Co-hydroxide are mixed. The Kang mixture is then calcined. The Examiner has asserted that claims 21 and 22 recite properties of the produced Li-Ni-Co-Mn-oxide compound which are considered inherent in view of the teachings of Kang.

First, to support a §103 rejection, the Patent Office must show all elements of the claimed invention in the reference. Applicants refer to the §102 response of the previous page and again note that the Patent Office has not made a *prima facie* case inherency for the reasons identified.

Applicants also note that Kang has not been shown to describe, teach, or suggest all of the limitations of Applicants' claims 21 and 22. For example, Kang describes (col. 1, lines 51-55), that "[e]xtensive testing has been conducted to investigate the effect of adding the above metal and fluorine dopants …" From this statement, *inter alia*, and considering the reference as a whole, it is clear that the purpose of Kang is fluorine doping of Ni-Mn-Co-oxide compounds to

improve electrochemical cycling performance. During the prosecution, Kang amended claim 1 such that the claimed material comprises "a composition of $Li_{1-x}Ni_{\alpha}Mn_{\beta}Co_{\gamma}M'_{\delta}O_{2-z}X_z$ (M′ = Mg, Zn, Al, Ga, B, Zr, Ti; X=F, S, Cl, I), wherein x is between ~~about~~ a value greater than 0 and about 0.333, α is between about 0.2 and 0.6, β is between about 0.2 and 0.667, γ is between ~~about~~ a value greater than 0 and about 0.333, δ is between ~~about~~ a value greater than 0 and about 0.2, and z is between ~~about~~ a value greater than 0 and about 0.5." (See Exhibit I, attached hereto, which is Page 2 of response to the non-final office action dated June 6, 2006 for Kang USSN 10/699,484). Kang also admitted (see Exhibit II, attached hereto, which is page 9 of the same office action) "[i]n particular, claim 1 has been amended such that the claimed material comprises Li, Ni, Mn, Co, M′, O_2, X, i.e. all are in an amount greater than at least 0"… so that "one skilled in the art would understand that the invention is operable in certain non-stoichemetric [*sic*, stoichiometric] ranges as cited by the applicants". See, e.g., In re Kumar, 76 USPQ2d 1048 (2005) (prior art does not render an invention unpatentable for obviousness unless the prior art enables a person of ordinary skill in the art to make and use the invention.). Thus, it appears that during the prosecution of Kang et al. the inventors amended to mandate the amount of X in the Ni-Mn-Co-oxide compounds to be greater than zero to make the patent operable, and so Kang is inoperable when X is absent, or at least loses any presumption for enablement as applied to Applicants claims. Furthermore, since the Kang invention is about fluorine dopants the description carries no presumption of enablement or any enabling disclosure when z = 0 (no fluorine). Therefore, Kang has not been shown to enable a person of ordinary skill in the art to make and use the invention of Kang without fluorine and as such Kang cannot render the present claims 21 and 22 obvious, at least since Kang has not been show to describe, teach, or suggest all of the limitations of Applicants' claims 21 and 22 with an enabling disclosure. Consequently, the rejection of claims 21 and 22 under 35 USC § 103(a) as purportedly being unpatentable over Kang et al. is improper and should be withdrawn.

Claims 4, 9 and 10 stand rejected under 35 USC § 103(a) as purportedly being unpatentable over Shiozaki et al. (JP 2002-304993).

Applicants have noted above (under § 102 section response) that Shiozaki has not been shown to describe, teach, or suggest all of the claim limitations of Applicants' claim 1. Claims 4, 9, and 10 all depend upon and further limit claim 1. No other reference has been included to

provide the missing elements. No showing has been made that the missing limitations necessarily flow from the cited references. Thus, the rejection of claims 4, 9, and 10 under 35 USC § 103(a) over Shiozaki et al. is unwarranted and should be withdrawn.

Conclusion

In view of the above, it is submitted that the application is in condition for allowance. Entry of the enclosed amendment, examination and reconsideration of the application as amended are respectfully requested. The Examiner is invited to telephone the undersigned Applicants representative to answer any questions or advance any issues.

Respectfully submitted,

25-Jan-2008
Date

By: /Dean M. Harts/
Dean M. Harts, Reg. No.: 47,634
Telephone No.: 651-737-2325

Office of Intellectual Property Counsel
3M Innovative Properties Company
Facsimile No.: 651-736-3833

DMH/SFW/spg

Remarks/Arguments begin on page 7 of this document.

Please amend the application as follows:

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A positive electrode material of substituted lithium nickel-manganese oxides for a non-aqueous lithium cell, comprising a composition of $Li_{1+x}Ni_{\alpha}Mn_{\beta}Co_{\gamma}M'_{\delta}O_{2-z}X_z$ (M'=Mg,Zn,Al,Ga,B,Zr,Ti; X=F,S,Cl,I), wherein x is between ~~about~~ a value greater than 0 and about 0.333, α is between about 0.2 and 0.6, β is between about 0.2 and 0.667, γ is between ~~about~~ a value greater than 0 and about 0.333, δ is between ~~about~~ a value greater than 0 and about 0.2, and z is between ~~about~~ a value greater than 0 and about 0.5.

2. (Currently Amended) The positive electrode material of claim 1, wherein the composition comprises $Li_{1+x}Ni_{\alpha}Mn_{\beta}O_{2-z}F_z$, and wherein x is between ~~about~~ a value greater than 0 and about 0.333, α is between about 0.2 and 0.6, β is between about 0.2 and 0.667, and z is between ~~about~~ a value greater than 0 and about 0.5.

3. (Currently Amended) The positive electrode material, of claim 1, wherein the composition comprises $Li_{1+x}Ni_{\alpha}Mn_{\beta}Co_{\gamma}O_{2-z}F_z$, and wherein x is between ~~about~~ a value greater than 0 and about 0.333, α is between about 0.2 and 0.6, β is between about 0.2 and 0.667, γ is between about 0.01 and 0.333, and z is between ~~about~~ a value greater than 0 and about 0.5.

4. (Currently Amended) The positive electrode material, of claim 1, wherein the composition comprises $Li_{1+x}Ni_{\alpha}Mn_{\beta}Al_{\delta}O_{2-z}F_z$, and wherein x is between ~~about~~ a value greater than 0 and about 0.333, α is between about 0.2 and 0.6, β is between about 0.2 and 0.667, δ is between about 0.01 and 0.2, and z is between ~~about~~ a value greater than 0 and about 0.5.

5. (Currently Amended) The positive electrode material of claim 1, wherein the composition comprises $Li_{1+x}Ni_{\alpha}Mn_{\beta}Ti_{\delta}O_{2-z}F_z$, wherein x is between ~~about~~ a value greater than 0 and about 0.333, α is between about 0.2 and 0.6, β is between about 0.2 and 0.667, δ is between about 0.01 and 0.2, and z is between ~~about~~ a value greater than 0 and about 0.5.

6. (Currently Amended) The positive electrode material of claim 1, wherein the composition comprises $Li_{1+x}Ni_{\alpha}Mn_{\beta}Co_{\gamma}Al_{\delta}O_{2-z}F_z$, and wherein x is between ~~about~~ a value

approximation such as the term "about" are descriptive terms that may be employed to avoid a strict numerical boundary to the specified parameter. *Ecolab*, 264 F.3d at 1367 citing, *Pall Corp. v. Micron Seps.*, 66 F.3d 1211, 1217 (Fed. Cir. 1995). Furthermore, without broadening terms the precise numerical ranges of a claim do not avoid a strict numerical boundary. *Jeneric/Pentron, Inc. v. Dillon Co., Inc.*, 205 F.3d 1377, 1381 (Fed. Cir. 2000) citing *Modine Manuf. Co. v. United States Trade Commission*, 75 F.3d 1545, 1554 (Fed. Cir. 1996) and *Pall*, 66 F.3d at 1217.

In summary, one skilled in the chemical arts would recognize that it is unnecessary to achieve absolute precision with respect to the ranges discussed above and that use of the term "about" captures reasonable deviations of the specified ranges that are clearly within the spirit of the invention. The use of the term "about" conveys the broader aspects of the invention to the degree of precision achievable in the art, given the limitation of expression in claim language. Applicants respectfully suggest that this rejection under §112 has been overcome and should be withdrawn.

Turning to the Examiner's rejection of the claims over the cited prior art, Applicants respectfully disagree with the application of the art to the claims as amended. Applicants have amended independent claims 1 and 14-16 to more particularly define the scope of the claimed invention. In particular, claim 1 has been amended such that the claimed material comprises Li, Ni, Mn, Co, M', O_2, X, i.e. all are in an amount greater than at least 0. Throughout the specification and drawings, various examples are given wherein such amounts are cited and one of skilled in the art would understand that the invention is operable in certain non-stoichemetric ranges as are cited by the applicants.

Claims 1, 2, and 8-15 stand rejected under 35 U.S.C. §102(b) as anticipated by the Ohzuku publication. Claims 1-4, 6 and 8-15 stand rejected under §102(b) as anticipated by U.S. Pat. App. Pub. No. 2002/0119374 in the name of Yang. Claim 15 stands rejected under §102(b) as anticipated by U.S. Pat. No. 6,040,090 issued to Sunagawa. Claims 16-20 were rejected under 35 U.S.C. §103(a) as being unpatentable over either Ohzuku or Yang in view of U.S. Pat. App.